Grade K-6 Science Initiative—Mathematics and Science Partnership Grant Proposal
September 9, 2013

Grant Summary:

Science Teachers Learning Content (Science TLC) will have a direct impact on approximately 100 teachers and an indirect impact on over 450 K-5 teachers in Columbia Public Schools, area non-public schools, and pre-service elementary teachers from the University of Missouri. Science TLC will provide teachers an opportunity to develop science content, strategies to integrate engineering and science practices, science content delivery strategies, and enthusiasm for science teaching. This will be accomplished through a volunteer two-week summer academy with follow-up experiences throughout the academic year. Week 1 will focus on teacher learning of science content and pedagogy facilitated by University of Missouri Science Education Center and Columbia Public Schools Science office in the area of Ecology. In week 2, participants will deliver content lessons for area K-5 students in a morning camp setting. Afternoons in week 2 will be devoted to using the lesson study model for teachers to reflect and revise lessons for use in the school year. Science TLC will be sustained by partnering year one participants with year two participants and in the final year adding year three participants to this partnership. Participants will receive ongoing training, practice reflection, and have interactions with the grant's mentor coaches while in content specific learning communities. Teachers will volunteer their participation in advanced courses and online modules following their first year of intensive training to provide a total of three years of ongoing professional development support. Upon completion of the program, the schools involved will have developed a sustainable community of quality science teachers, mentors, and coaches.

There are no matching funds required for this grant.

Grant funds requested:	Year 1 2013-2014:	$397,693
	Year 2 2014-2015:	$439,599
	Year 3 2015-2016:	$500,000

Science TLC Grant Budget	Year 1 Oct 13-June 14	Year 2 July 14-June 15	Year 3 July 15-June 16
Mentor Salaries: 10 hours per month x $27/hr x 12 months yr 1: 5 mentors, yr 2: 10 mentors, yr 3: 15 mentors x 12 months	$ 16,200	$ 32,400	$ 48,600
Certificated Salaries Summer Academy 30 teacher participants x $27 x 6 hours x 8 days	$ 38,880	$ 38,880	$ 38,880
Certified Salaries Mentor Summer Training 5 mentors x $27 x 6 hours x 12 days	$ 9,720	$ 9,720	$ 9,720
Master Science Coaches - .42 part-time tchr. FTE x $66,000 = $27,720 x 2 coaches	$ 55,440	$ 55,440	$ 55,440
Advanced summer course: $27 x 6 hours x 3 days yr 2: 30 teachers, yr 3: 60 teachers		$ 14,580	$ 29,160
Total Certificated Salaries	$ 120,240	$ 151,020	$ 181,800
Noncertificated - .5 Clerical	$ 15,000	$ 15,000	$ 15,000
Total Certificated Salaries	$ 15,000	$ 15,000	$ 15,000
Total 6100: Salaries	$ 135,240	$ 166,020	$ 196,800
Mentor Salaries: 10 hours per month x $27/hr yr 1: 5 mentors, yr 2: 10 mentors, yr 3: 15 mentors x 12 months	$ 4,860	$ 9,720	$ 14,580
Certificated Salaries Summer Academy 30 teacher participants x $27 x 6 hours x 8 days	$ 11,664	$ 11,664	$ 11,664
Certified Salaries Mentor Summer Training 5 mentors x $27 x 6 hours x 12 days	$ 2,916	$ 2,916	$ 2,916
Master Science Coaches -2 - 55,440x 30.00%	$16,665	$16,665	$16,665
Noncertificated - .5 Clerical	$4,500	$4,500	$4,500
Advanced summer course: $27 x 6 hours x 3 days yr 2: 30 teachers, yr 3: 60 teachers		$ 4,374	$ 10,206
Total 6200: Employee Benefits	$ 40,605	$ 49,839	$ 60,531
Nonpublic 7 nonpublic teachers x $27 x 6 hours x 10 days	$ 11,340	$ 11,340	$ 11,340
Nonpublic advanced summer courses $27 x 6 hours x 3 days yr 2: 7 teachers yr 3: 14 teachers		$ 3,402	$ 6,804
Leadership Team Travel to NSTA Conference: PI, Co-PI, 3 MU Grad assistants, 5 mentors (yr 1), 10 mentors (yr 2), 15 mentors (yr 3) 2 coaches, 2 secondary advisors	$ 21,490	$ 29,165	$ 36,840
Mento/Advisor Release Days for coaching and NSTA travel (substitute costs) yr 1: 7 teachers x 8 days x $100, yr 2: 12 teachers x 8 days x $100, yr 3: 17 teachers x 8 days x $100	$ 5,600	$ 9,600	$ 13,600

University of MO Contracted Services: one month salara of co-PI ($15,000), 3 graduate assistants ($15,000)	$ 69,651	$ 69,651	$ 69,651
Outside evaluator services	$ 15,000	$ 15,000	$ 15,000
Total 6300: Purchased Services	$ 123,081	$ 138,158	$ 153,235
Summer Academy materials, books, printing, probes,and supplies	$ 15,000	$ 5,000	$ 3,596
3 ipads for coaches	$ 1,500		
37 MAC Airs for teachers, coaches, mentors - Year 1, Year 2 - 30 MAC Airs x $950 for new group of teachers; Year 3 - 30 MAC Airs x $950 for new group of teachers.	$ 35,150	28,500	26,600
Total 6400: Materials/Supplies	$ 51,650	$ 33,500	$ 30,196
Total	**$ 350,576**	**$ 387,517**	**$ 440,762**
Indirect Cost 13.44%	**$ 47,117**	**$ 52,082**	**$ 59,238**
Total	**$ 397,693**	**$ 439,599**	**$ 500,000**

Science Teachers Learning Content (Science TLC) Grant Proposal

DRAFT

This document represents a draft grant proposal. A final copy of the grant application that is submitted to the Missouri Department of Elementary and Secondary Education on September 18 will be presented to the Columbia Board of Education on October 14.

Section V – Abstract:

Science Teachers Learning Content (Science TLC) will have a direct impact on approximately 100 teachers and an indirect impact on over 450 K-5 teachers in Columbia Public Schools, area non-public schools, and pre-service elementary teachers from the University of Missouri. Science TLC will provide teachers an opportunity to develop science content, strategies to integrate engineering and science practices, science content delivery strategies, and enthusiasm for science teaching. This will be accomplished through a two-week summer academy with follow-up experiences throughout the academic year. Week 1 will focus on teacher learning of science content and pedagogy facilitated by University of Missouri Science Education Center and Columbia Public Schools Science office in the area of Ecology. In week 2, participants will deliver content lessons for area K-5 students in a morning camp setting. Afternoons in week 2 will be devoted to using the lesson study model for teachers to reflect and revise lessons for use in the school year. Science TLC will be sustained by partnering year one participants with year two participants and in the final year adding year three participants to this partnership. Participants will receive ongoing training, practice reflection, and have interactions with the grant's mentor coaches while in content specific learning communities. Teachers will participate in advanced courses and online modules following their first year of intensive training to provide a total of three years of ongoing professional development support. Upon completion of the program, the schools involved will have developed a sustainable community of quality science teachers, mentors, and coaches.

Section VI – Commitment and Capacity of Partnership

The partners in Science TLC will include Columbia Public Schools, the University of Missouri (MU) Science Education Center, Department of Learning Teaching and Curriculum, Division of Biological Sciences and Department of Civil and Environmental Engineering. Columbia Public Schools (CPS) Science Coordinator will oversee the project and will lead professional development during the summer academy and follow-up PD along with partners from the MU partners who provide additional expertise in the science and engineering contents areas and pedagogy. CPS will be the fiscal agent for Science TLC. The MU Science and Science Education Departments will coordinate with the CPS Science Coordinator to develop the summer content courses and activities for the student summer camp held in Week 2. These partners will work collaboratively to ensure project goals and objectives are met.

<u>Partner Descriptions</u>

Columbia Public Schools (CPS)

Mr. Mike Szydlowski, CPS K-12 Science Coordinator, will be the Principal Investigator. He will supervise gathering and organizing information on the needs of the school district in the areas of content, curriculum, pedagogy, materials, mentoring and assessment. He will function as the chair of the Leadership Team, which will determine the curriculum and activities of the academy. He will oversee the grant account, and accounts submitted by the subcontractors. He will be responsible for completing all forms and assuring that requirements and guidelines are followed. Mr. Szydlowski has 15 years of experience in science education in public schools and has been a K-12 science coordinator since 2004. Mr. Szydlowski earned his Master of Education from Lindenwood University in Educational Administration and Secondary Science Bachelor's degree from the University of Missouri-Columbia. Mr. Szydlowski serves on the elementary and supervisory committee of the National Science Teacher's Association, was awarded a Toyota Science Education grant, earned St. Louis Science Center Excellence in Science Teaching award, earned district teacher of the year status, and has received and run several science grants.

University of Missouri College of Education: Dr. Troy Sadler, Professor of Science Education and Director of the MU Science Education Center, will serve as the Co-PI.

University of Missouri Science Department: Dr. Lori Eggert, Associate Professor in the Division of Biological Sciences, .

External Evaluator: Dr. Anna Waldron, Dr. Waldron has over thirteen years' experience evaluating teacher professional development programs and is the PI for evaluation of the Missouri Department of Higher Education's ITQG program.

Three Coaches who are retired master elementary science teachers will be hired. Each will work with teachers in the grant program and academy through regular classroom visits. They will provide feedback to teachers and to project staff during the academy and throughout the school year.

The coaches will assist teachers in the development of new lessons and units that their students will be involved in. The coaches will also attend the summer academies.

Governance Structure

Three tiers of participants will provide guidance to Science TLC: The Leadership Team, Mentorship Team, and Teaching Team as described below.

The **Leadership Team** will consist of the PI, Mr. Mike Szydlowski (CPS K-12 Science Coordinator), Co-PI Dr. Troy Sadler (Director of Science Education Center, MU), Dr. Lori Eggert (Professor of Biology, MU), XXXXX (Professor of Engineering, MU), two science coaches, two CPS secondary science teachers, and one teacher per participating school to serve as a science mentor for his/her building. This team will collaboratively design and facilitate the summer academy and academic year follow-up activities. The Leadership team will make all decisions in a collaborative manner. Other members of the project staff, faculty, consultants, and evaluators will meet with the Leadership Team regularly throughout the program. This committee will coordinate communication and dissemination efforts and provide ongoing support and professional development to the teachers, coaches, mentors, and all others involved.

The **Mentorship Team** will consist of one teacher from each participating school. Each mentor will be selected based on prior success and expertise of teaching science in a manner that is consistent with the goals of the Science TLC program. Additionally, the Mentorship Team will receive professional development in science education and mentorship prior to the start of their role. The Mentorship Team will work with the Leadership Team to develop strategies that foster increased collaboration of science content and pedagogy in their buildings. The mentors will regularly meet with the district science coaches and participating teachers in their building to foster excellence in elementary science teaching. Mentors will be released one day per month to observe and reflect with the participating teachers in their building.

The **Teaching Team** will consist of approximately 6 teachers per participating building each year. There will be 5 participating buildings plus non-public schools per year. The teachers will consist of teachers in grade bands K-1, 2-3, and 4-5. The Teaching Team will be selected based on their need and desire to improve science education and practices. Each member of the Teaching Team will participate in a two-week summer academy, 40 hours of follow up professional development the following year, an advanced topic class the second summer, as well as participate in online science education modules created by the Leadership Team.

Section VII – Project Narrative and Timeline

Section VII.1. Program Goals and Objectives

Columbia Public Schools is a high-need school district. The free and reduced lunch rate for CPS is 39.6%, with several elementary schools exceeding 60% free and reduced lunch counts: Benton (91%), Alpha Hart (72.9%), Blue Ridge (69.3%), Derby Ridge (57.1%), Parkade (62.1%) and West Blvd (75.3%). While our K-5 elementary teachers have the proper certification in elementary teaching, only a very limited number of these teachers have had any formal training in the area of science or science education. CPS has critical needs for supporting science teaching and learning across all elementary grades. Prior to 2010, 4th and 5th grade science in the district was taught by science specialists, but these positions were eliminated due to budget cuts. This means that many of our 4th and 5th grade teachers had never before taught science in their careers. In grades K-3, the emphasis on mathematics and language arts has lead to a steady decline in attention to science. Given developments with the Common Core State Standards for Mathematics and English Language Arts as well as Next Generation Science Standards, it has become clear that all learners, including elementary students, need opportunities to engage in literacy and numeracy practices in the context of science (Blank, 2012). CPS district leaders recognize the importance of high quality science education and the need to support elementary science education as an essential component of ensuring student success in all academic

areas. It is critical that we provide immediate assistance to our teachers so that our students can receive quality science instruction. CPS has the focus schools Benton, Alpha Hart Lewis, Blue Ridge, Derby Ridge, West Blvd, and Parkade.

To address these needs, the overall goal of Science TLC is to build a partnership involving Columbia Public Schools, The University of Missouri, and regional non-public schools to provide ongoing professional development in improving the science content knowledge of teachers in grades K-5 that increases their enthusiasm and pedagogical skills for teaching science. Six objectives will contribute to the accomplishment of our goal.

Program Objectives

1. Increase the percentage of K-5 teachers demonstrating mastery of science content in grades K-5 as measured by pre-and-post science assessments developed by the MU Science Education Center.
2. Students will meet established benchmarks for proficiency and/or growth in science and mathematics in grades K-5 as measured by district common assessments.
3. Increase the proficiency rates of students on the 5th grade MAP Science Assessment by increasing the number of students Proficient and Advanced each year.
4. Increase the knowledge base of K-5 teachers in the area of science, engineering, and community integration through participation in Placed Based Education professional development as measured by teacher journaling and mentor observations.

Section VII.2. Program Activities

Because of the district's need for quality science content development for our K-5 teachers, Science TLC would immediately impact K-5 teachers the first summer of the grant and continue for the three years of the grant and beyond. In each of the three years of grant funding, teachers will be involved in an intensive and real-world science summer academy that will provide opportunities for

teachers to participate, as learners, in developing their knowledge of the progression and content of life science in the elementary years and beyond. This two-week program will be modeled after the successful QUEST (Quality Elementary Science Teaching) program developed by the University of Missouri Science Education Center with support from the Improving Teacher Quality Program funded through MDHE. Key elements of this model include 1) opportunities for elementary teachers to spend time exploring science content and processes as well as their own misconceptions as adult learners; 2) support for teachers in planning high quality science instruction for elementary learners; 3) opportunities to practice implementation of science instruction with elementary learners; and 4) focused reflection and analysis of learning and teaching opportunities with an eye toward enacting transformative science instruction in their own classrooms.

The Science TLC program will focus on content related to the life sciences and engineering. We have chosen to focus on particular science themes so that teachers will be able to explore content and associated science practices in depth and so that teachers working with multiple grade levels across the K-5 spectrum can consider anticipated student learning progressions (NRC, 2007). The life sciences represent an important area of the CPS science framework, Missouri K-5 GLEs, and the Next Generation Science Standards. Engineering is emerging as an important curricular focus particularly as a context for applying science ideas and problem-solving and as an important dimension of college and career readiness. Both areas, the life sciences and engineering, have been identified as areas of need for elementary teacher professional development in the CPS district. The combined focus of life sciences and engineering also creates novel opportunities to introduce elementary teachers and students to engineering that moves beyond building toothpick bridges and egg drops and encourage thinking about more expansive notions of engineering including bioengineering, biomimicry, biotechnology, and environmental engineering.

The first year of the experience will highlight ecology as a content focus; in the summer academy, teachers will explore core ecological concepts, environmental engineering challenges, pedagogies to support ecology learning, and K-5 student learning progressions in ecology. The second year of the experience will focus on the heredity and engineering applications in biotechnology, and the third year will focus on structure and information processing in the life sciences and bioengineering. Participating teachers will be encouraged to apply the ideas and pedagogical principles modeled with each of these particular content focus areas to the full range of science content taught across the elementary science curriculum. Throughout the program, Place Based Education will be a featured component of the summer academies. Place Based Education immerses students in local heritage, culture, ecology, landscapes, opportunities, and experiences as a foundation for the study of language arts, mathematics, social studies, science, and other subjects. Place based education encourages teachers and students to use the schoolyard, community, public lands, and other special places as resources, turning communities into classrooms. The 5E learning cycle (Bybee, 2007) and the Seamless Assessment model (Abell & Volkmann, 2011) will serve as frameworks for designing instructional and assessment experiences..

Science TLC will create a professional development model that will include the following critical elements: 1) school-based teams with a local teacher-leader (to build local communities that will support each other as they reform science education throughout their schools), 2) summer academy including PD and practice teaching with students in a science summer camp setting, 3) in-class coaching throughout academic year, 4) follow-up support through coursework and online portal learning.

The Science TLC program will provide 140 hours of contact time per participant in the first year of the cohort and an additional 20 or more hours of contact time per additional year of the program. The program will include a two-week intensive science content and pedagogy experience that will be structured as follows:

Week 1: Approximately 100 teachers will participate in the Science TLC science professional development program over the three-year course of the grant. The first week of the K-5 summer academy will involve activities, a deeper understanding of science content, and experiences around the theme of Ecology with local experiences and lesson/unit development that builds teacher confidence in science content delivery and integration. Ecology was chosen as the theme this first year as an emphasis will be placed on the learning progressions from Kindergarten through fifth grade on this topic. The Teaching Team will develop field experiences that span multiple grade levels along the ecology theme that increase in intensity and complexity as the student grows. Specific topics are selected to address teachers' greatest area of need in terms of subject matter knowledge and standards most difficult for students to master. This two-week period will be taught as a graduate level course by the MU Science Education Center. Science professors and education faculty will lead this week of the academy from MU with the science coordinator and facilitators from CPS. Teachers will also learn strategies to incorporate engineering as a central theme of their Ecology focus. This first week will also be devoted to developing lessons, experiences, and assessments that teachers can use in their own classroom with students. Teachers will work together with content experts and MU faculty to develop and conduct peer reviews of teacher led strategies for the classroom.

Week 2: During the second week of the summer academy, teachers will be given the opportunity to teach elementary students through a week-long half day science camp for students. This model allows for immediate application of the new knowledge and skills gained in the previous week. Too often quality professional development does not have an impact on students because teachers are not given the time to practice what they learned. This model allows teachers to practice what they have just learned and engage in critical reflection and peer review. The process makes it possible for teachers to receive feedback and consider modifications necessary before implementing science instruction in their own classrooms.

Approximately 100 students would be provided with the free summer camp experience in all grade levels kindergarten-fifth grade each summer. The second week of the summer academy will be developed with the following structure:

Component 1: Morning sessions

Each morning session consists of a student summer camp experience where teachers can practice and be reviewed delivering what they have developed during the first week of the academy. This experience will allow teachers to refine their lessons before presenting to their own students in order to achieve greater confidence and success.

Component 2: Afternoon sessions

In collaboration with CPS content experts and MU faculty, each afternoon the teachers will use the lesson study model to reflect on the science and pedagogy of that morning's session. Time will be devoted to improving the content, pedagogy, and lesson materials so teachers are excited and confident with delivering this knowledge to his or her students.

Pre-Academy Workshop for Mentor Teachers

The Science TLC program will use the philosophy of "train the trainers". Each participating school will have a mentor teacher. In addition, all of the participating schools will share 2 science coaches that will rotate schools providing help to the mentor and Teacher Teams.

The mentor teachers, science coaches and summer academy facilitators will go through a three day pre-academy in which the concepts of the 5E Learning Cycle, Engineering integration, scientific practices, and formative assessments will be practiced. Mentors and facilitators will also go through mentor training to learn the most beneficial strategies for coaching peer teachers.

In addition, mentors and the Leadership Team will attend the National Science Teachers Association annual conference each spring to provide leaders with real-time science content and pedagogy in the area of engineering integration, assessment, and science practices. Each member of the leadership team will participate in conference sessions that align with Science TLC goals, and the full

team will convene daily in a working session to synthesize learning and consider strategies for applying new ideas to the Science TLC activities.

Mentor teachers will also play a key role as small-group leaders to their school's Teacher Team during the academic follow up years. This system is intended to build a capacity of competent and confident science teacher teams in each elementary school. The practice of building sustainable science communities in the schools will ensure that the goals of the Science TLC program become standard across the institution as a whole to provide long-term sustainability long after the grant has ended.

Timeline for Science TLC

TIMELINE ("1" corresponds to cohort 1; "2" corresponds to cohort 2; "3" corresponds to cohort 3)

Goal-Primary Activity	Pre	Yr 1:Oct 2013 -Sep 2014			Yr 2:Oct 2014 -Sep 2015			Yr 3:Oct 2014 -Sep 2016		
		Fall	Spr	Sum	Fall	Spr	Sum	Fall	Spr	Sum
Establish partnerships with district, university science departments and university teacher education program	✖									
Identify content focus and PD frameworks	✖									
Select science coaches		1			2			3		
Select schools and mentor teachers		1			2			3		
Plan summer academy		1	1		2	2		3	3	
Recruit & select teacher participants			1			2			3	
Leadership team attend NSTA			1			2			3	
Pre-academy workshop for mentor teachers				1			2			3
Summer academy				1			2			3
In-class coaching by science coaches & mentor teachers					1	1		2	2	
Teachers participate in online community					1	1	1	1,2	1,2	1,2
Follow-up course							1			1,2
Project Evaluation		←								→
Eval reports (F=form./S=sum)				✖			✖			✖

Section VII.3. Partnership Meetings and Communication

The CPS Science Department has convened an Elementary Science Leadership Team comprised of a teacher representative from each building to address concerns about elementary science. Members of the Science TLC Advisory Board and Leadership Team will work with the Elementary Science Leadership Team to identify areas of need to improve the teaching of elementary science in our schools. The Leadership Team will meet on an ongoing basis to plan, measure progress, and implement Science TLC. The Science TLC Leadership Team will also meet with the external evaluator at least twice per year to assess progress toward our objectives.

Section VII.4. Institutional Capacity

Because of the K-5 focus on content, practices, and coaching, Science TLC is well situated to engage multiple partners, groups, and teachers in improving science content knowledge. The CPS Research, Assessment, and Accountability Department provides support in the areas of research,

evaluation, and development of common assessments. This department works closely with the CPS Science Department and has partnered with MU on many projects over the years. These partnerships are critical to MU and CPS so we can provide ongoing support to our elementary teachers and serve as a training ground for pre-service teachers.

Section VII.5. Follow-Up Activities – Sustaining the Effort

After the completion of the two week summer science academy, teachers will continue the lesson study model by planning, presenting and reflecting on science lessons developed in the summer by CPS teachers in collaboration with MU. The follow-up during the school year will involve three components.

Academic Year Follow-Up Activities

Teachers will participate in 40 hours of professional development during the academic year following their summer academy experience. The follow-up activities promote the sustainability of the Science TLC program by providing ongoing support and collaboration as well as feedback opportunities for every teacher involved in the program. The mentor teachers and district science facilitators will play a key role in the follow-up activities by working with their schools Teacher Team to develop lessons, provide feedback and collaboration, and to develop quality rigorous assessments. The assessments will be built using the practices of the Next Generation Science Standards, which require students to identify and design solutions to problems and to apply learning across multiple contexts.

1. Coach Mentor Support and Journaling

Teachers will keep a journal noting their successes and concerns after each science lesson they delivered to their students. Each teacher will be asked to write a short entry after each lesson that describes what went well, what needs to be improved, or what is needed to make the experience a success in their classroom. The mentors will meet with the teachers regularly to discuss and review the journals in order to meet the needs of the teacher during future professional development activities.

Mentors will be asked to look for items that can be addressed immediately to boost the confidence and success of the teacher even before the next professional development day. District science coaches will meet with the Teacher Teams monthly and with the mentors weekly to determine needs for the each Teacher Team to be successful. The coaches will assist the mentors in modeling engaging, rigorous, and meaningful science in the classrooms. At each meeting the coaches will discuss a chapter from Engagement Strategies Vol. 1 by William Daggert. After the discussions, the coaches will model how the strategies can be used to enhance engagement in science. Before the next meeting the coaches will observe and provide feedback to the teacher using a strategy from that month.

2. Online Learning Modules

The Leadership Team will develop online short courses and discussion groups for participants to continue their learning throughout the process. The short courses will be run through the Blackboard system already owned by Columbia Public Schools. The short courses taken by participants will include: Engineering Integration Lesson Design, Student Engagement, Applying the Science TLC framework to other science content (i.e., science areas beyond the specific focus of each summer academy), and Authentic Assessments Design. These learning modules will give teachers a boost by providing advanced and relevant learning that can be applied in their classroom immediately. The follow-up learning experiences are in addition to the pre-exercises teachers will participate in prior to their summer academy.

3. Advanced Courses

Teachers involved in the first cohort will be asked to participate in a portion of the following years' week two academy to provide reflection and assistance to the second cohort of teachers. After completion of their cohort, teachers will mentor other elementary teachers within their buildings who did not participate in the initial field experience. In addition, past participants will take part in two additional days of advanced summer academy where they will learn best practices in another area of life

science using the pedagogy learned in year 1. The advanced course in year 2 will focus on the heredity progression and the advanced course in year 3 will focus on the Structure and Information Processing progression.

Sustainability

Teachers who participate in Science TLC will become confident and highly qualified teachers of science. By creating a culture for high quality science education, the teachers, schools, MU, and the CPS Science Department will continue Science TLC by modeling, mentoring, and follow up professional development long after the conclusion of the grant funded program. Once our teachers participate in Science TLC, CPS has the capacity to provide ongoing yearly assistance to experienced teachers to continue their development as well as the development of new teachers. Professional development to continue Science TLC support for teachers will be included in the science CPS budget and supported by the MU Science Education Center. The district will also seek partnerships in business and educational organizations to provide funding for enhanced development of our new elementary teachers.

SectionVII.6. Coordination with Existing Programs and Initiatives

There has been considerable focus in organizations such as the National Science Teachers Association given to the importance of science education beginning in the elementary years as well as STEM initiatives, and engineering integration that are well aligned with the goals of this grant proposal. Programs such as Physics First have been very successful in school districts that provided the proper teacher development for such a program at the secondary level. Science TLC would continue to emphasize quality science teaching down to the elementary level, which is critical if we wish to develop confident and well-balanced students at all levels of education. Our district has learned from previous programs that engaging teachers in intensive one-year cohorts is more successful than delivering professional development to random groups of teachers that do not work together to achieve their goals. We will capitalize on this learning by creating a new cohort in each year of the program. All cohorts

will continue the follow up professional development long after the funding has ended. This cohort system will also allow the development of teacher leaders that will assist in the teaching of future cohorts. Science TLC will create teacher enthusiasm and confidence in science, which is imperative if we wish to transfer enthusiasm and confidence to students.

Section VII.7. Alignment to State Content and Professional Development Standards

The content in the summer academies and follow up professional development will be aligned with current state and national science standards. Science TLC will also be aligned with the National Staff Development Council's Standards for Staff Development. The academy and follow up activities will deepen teachers' content knowledge and provide them with research-based instructional strategies. The extensive resources available through our MU partnership will enhance teachers' learning and ensure collaboration. In addition, Science TLC aligns well with the content and beliefs of the Common Core and Next Generation Science Standards, which emphasizes real-world learning and problem solving in all subject areas.

Section VII.8 Research Base to Support Project

The U.S. National Science Education Standards and the newly developed Next Generation Science Standards address the importance of high quality science experiences in the elementary schools. These standards stress the need for all teachers of science to understand the science, to deal with personal and social issues, and make conceptual connections between science and other school subjects. Much of the literature concerning elementary science education has focused on issues such as the lack of science teaching in elementary classrooms, elementary teachers' lack of science content knowledge, and elementary teachers' tendency to have negative attitudes toward science.

Reflecting on classroom actions facilitates changes in behavior (Short & Greer, 2002). By reflecting on lessons, teachers identify instructional strategies that are effective or selected content objectives. The idea behind lesson study is to improve classroom teaching and learning through

planning, presenting, and reflecting. In lesson study, one or a few lessons are planned and studied in collaborative settings. The same lesson is repeatedly analyzed and improved over an extended time. Lesson study focuses on helping teachers refine instructional techniques; however, it also can provide lessons for use in curriculum materials. Another possibility with lesson study is to help teachers with specific content training that is not in their background.

Effective professional development must provide avenues for new learning, ideally about practice elements that can transfer directly into classroom settings. This professional development should build both content and pedagogical knowledge. Feeling excited before confronting a new situation may increase a person's sense of efficacy toward the task he or she faces. Research during the past 30 years has revealed a positive relationship between self-efficacy beliefs and academic performance and persistence (Martin & Marsh, 2006; Multon, Brown, & Lent, 1991; Skaalvik & Skaalvik, 2004).

Section VII.9. Partnerships with School Improvement Efforts

The goals and objectives of Science TLC are well aligned with our school district and state school improvement efforts. CPS has six Title schools and fifteen of our 19 elementary schools are in school improvement. Our schools that have been identified with the greatest need based on student achievement will be targeted first to create instant Science TLC learning communities within each of those buildings. By creating cohorts by building groups we will be much more effective at meeting the unique needs of those students and teachers.

Section VIII – Bibliography

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Section IX – Evaluation and Accountability Plan

Evaluation of the proposed Summer Academy will be led by Dr. Anna Waldron at MU. Dr. Waldron has over ten years' experience evaluating teacher professional development programs and is the PI for evaluation of the Missouri Department of Higher Education's ITQG program. Tools developed and validated for use in the ITQG program will be adapted for use in evaluation of the proposed academy. Teacher content knowledge, application of content knowledge and skills into the classroom, integration of technology, professional development impact on student assessments, and other factors will be evaluated. The evaluation will utilize a mixed methods approach that uses the program goals as the basis for creating indicators of program success. A graduate student trained in evaluation will work with the project team to develop new tools specific to the academy program, to adapt other statewide evaluation tools developed through ITQG, and to collect, analyze, and synthesize the data under the supervision of Dr. Waldron. Feedback will be provided through de-briefing sessions with the project team immediately following each academy as well as documented yearly through annual evaluation reports that summarize yearly findings.

Evaluators will conduct a mixed-method, quasi-experimental evaluation of the project. Guiding evaluation questions (aligned to project objectives) are:

1. Does the project increase the number of teachers who are highly qualified to teach elementary science?
2. What is the effect of the project on teachers' acquisition of knowledge of specified science content?
3. What is the effect on student achievement in specified science concepts of those teachers in the project?
4. What is the effect on teachers' enthusiasm and confidence in teaching science?

The evaluation process will consist of a formative and summative evaluation. The formative evaluation will involve tracking the progress and components of project activities and outputs. The summative evaluation will document outcomes related to the project objectives and evaluation questions. Pre, post, and progress tests will be given to participating teachers to set a baseline, measure progress and needs, and summarize the increase in science content developed during this program. Common student assessments will be developed in all grade levels to maintain high standards while monitoring the science and integrated math success of our students. The student common assessments will be district wide so the comparison of teachers involved in the program and not involved can be seen and addressed.